Using Fatty Acid Profiles of Fishes to Diagnose Watershed Health

Martha J.M. Wells and Le-Ellen Dayhuff-Nelson

Center for the Management, Utilization, and Protection of Water Resources and Department of Chemistry, Tennessee Technological University, Box 5033, Cookeville, TN 38505

Biographical Sketches of Authors

Dr. Martha J.M. Wells, an environmental chemist, is Professor of chemistry with the Center for the Management, Utilization and Protection of Water Resources and Chemistry Department at Tennessee Technological University. She has professional experience in federal, industrial, and academic laboratories and has conducted extensive research in sample preparation and chromatographic techniques. Wells' current research interests are focused on pollutant fate and transport, fatty acid characterization in fishes, humic substances and disinfection by-products, endocrine disrupting chemicals, and environmental justice. Wells currently serves as Alternate Councilor on the Executive Committee of the American Chemical Society Division of Environmental Chemistry.

Le-Ellen Dayhuff-Nelson is an Assistant Professor of Mathematics at Volunteer State Community College, and a Ph.D. candidate in Environmental Sciences—Chemistry Concentration at Tennessee Technological University. She is researching fatty acids in fish under the direction of Dr. M.J.M. Wells at the Center for the Management, Utilization and Protection of Water Resources. Their study of specimens collected from the Ohio River demonstrated that the fatty acid profile indicates existence of geographic subpopulations of fishes.

Abstract

This presentation promotes the potential use of fish fatty acid profiling in a water quality monitoring program for diagnosing watershed health.

The lipid content of an organism and the fatty acid composition of these lipids depend on biological and physiological processes and environmental conditions. The lipid content and distribution of individual fatty acids in fishes may vary among age, sex, species, location, or season. All of these factors may be influenced by diet, as the food supply of fishes differs among bodies of water over time according to environmental conditions. Bodily lipid stores of fishes also directly influence the retention of hydrophobic organic pollutants.

To date, percent total lipids in the white muscle fillet has been measured in our laboratory for 846 individual fish, and the fatty acid profiles of 731 of those individual fish were evaluated. Fish species examined included: largemouth bass (wild and cultured), black crappies (wild and cultured), black-nose crappies (cultured), white crappies (wild and cultured), walleyes (wild and cultured), white bass (wild), striped bass (wild), *Morone* hybrids (wild), channel catfish (wild), smallmouth buffalo (wild), sauger (wild), and paddlefish (wild). The fishes analyzed in our research were sampled from various locations including: Chicamauga Reservoir (TN), Norris Reservoir (TN), Cherokee Reservoir (TN), Tims Ford Reservoir (TN), Greers Ferry Reservoir (AR), Huntsville Creek (AL), Eagle Bend State Hatchery (TN), Hopper-Stevens Hatchery (AR), American Sport Fish Hatchery (AL), and six locations in the Ohio River (WV, OH, KY, IN, IL).